The Nation's Research Agenda at a Crossroads

Dr. G. Wayne Clough

President, Georgia Institute of Technology

Chancellor's Distinguished Lectureship Series
Louisiana State University
September 8, 2003

"We've come through a period of finally understanding the nature and magnitude of humanity's transformation of the Earth. Having realized it, can we become clever enough at a big scale to be able to maintain the rates of progress?"

Dr. William C. Clark
Biologist, Harvard University
New York Times, Aug 20, 2002

"Imagine a future of relentless storms and floods; islands and heavily inhabited coastal regions inundated by rising sea levels; fertile soils rendered barren by drought and the desert's advance; mass migrations of environmental refugees; and armed conflicts over water and other precious natural resources."

Kofi Annan
United Nations Secretary General
Time, Aug 26, 2002

Georgia Tech civil engineers took a portable high-tech damage survey system they developed for earthquakes to Ground Zero after the September 11 attacks, providing immediately usable information in the recovery effort and mapping heavy debris for removal from the site.

In 1946 physicists at Harvard and Stanford discovered and explored the phenomenon of nuclear magnetic resonance in the course of studying the spin characteristics of basic matter. This discovery was the basis for magnetic resonance imaging (MRI), which has revolutionized diagnostic medicine.

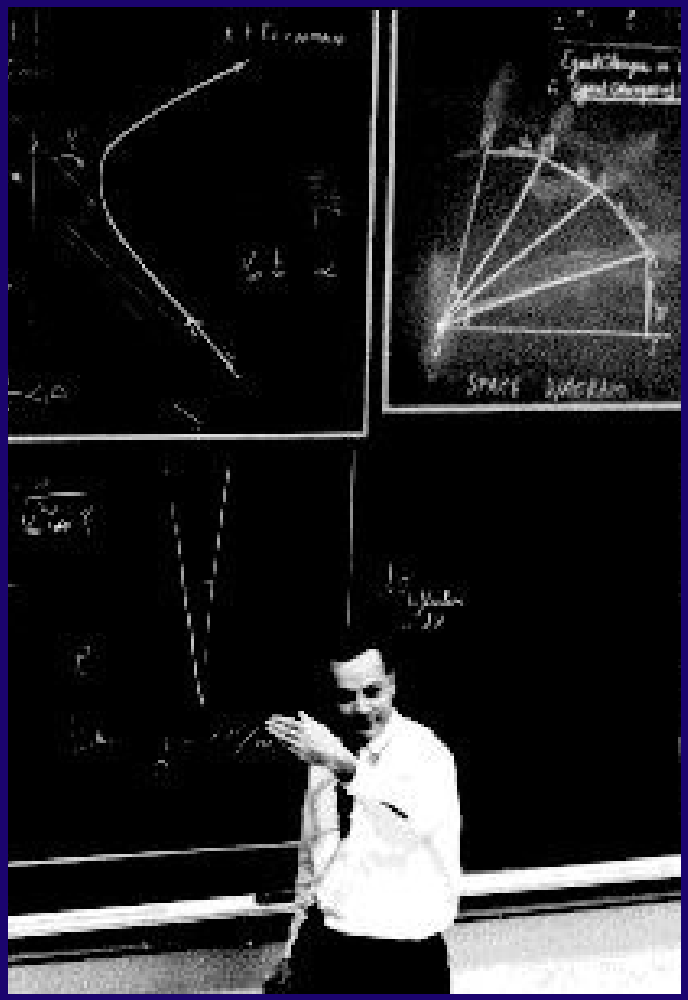
NSF Nifty Fifty

Nikita Krushchev

"The heritage of the past is the seed that brings forth the harvest of all the future."

National Archives plaque

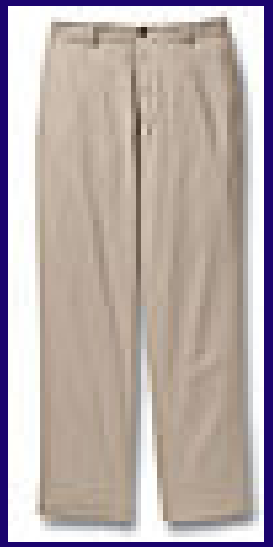
Richard Feynman



Courtesy of the Archives, California Institute of Technology

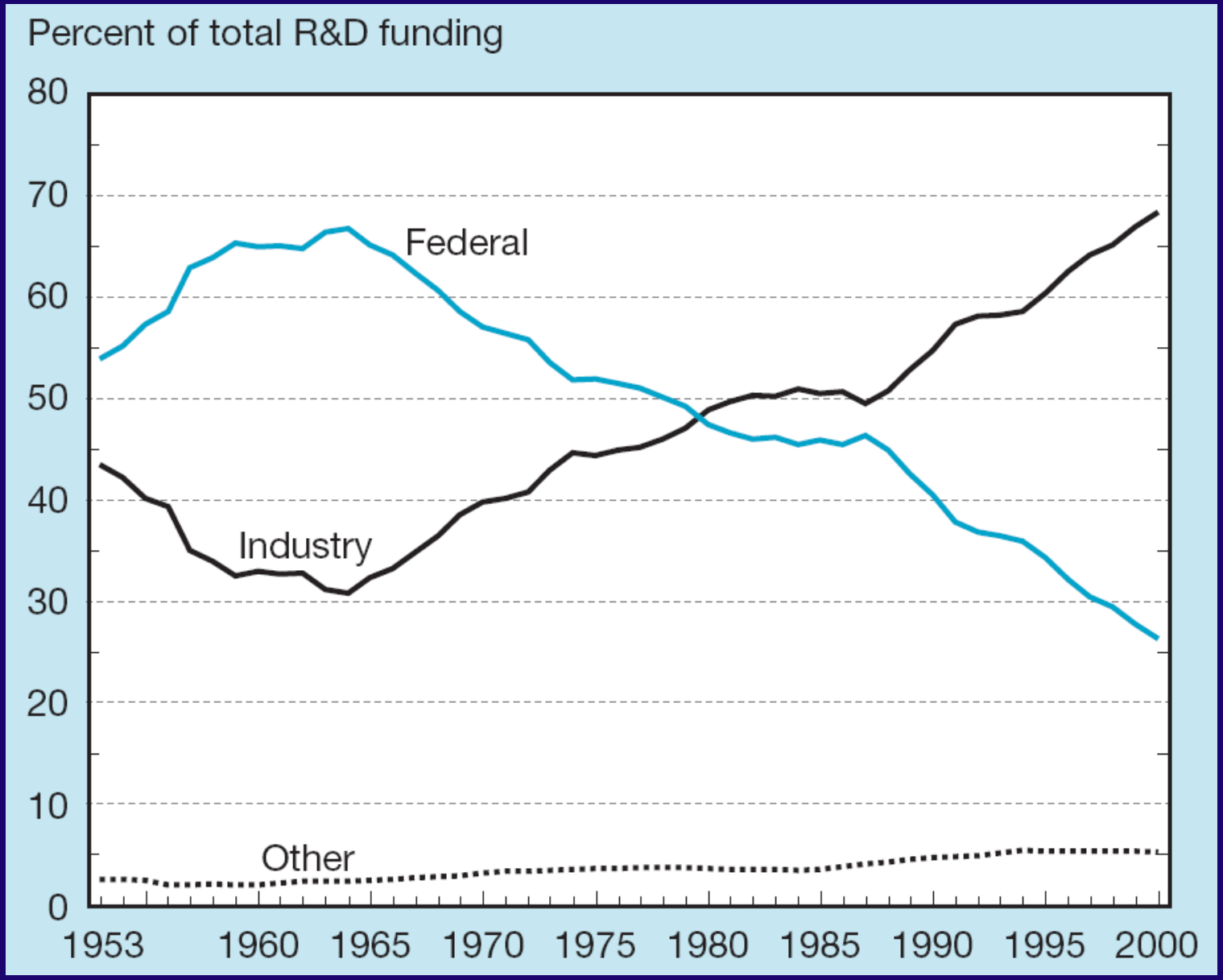
GM Safari

PPG Industries self-cleaning windows



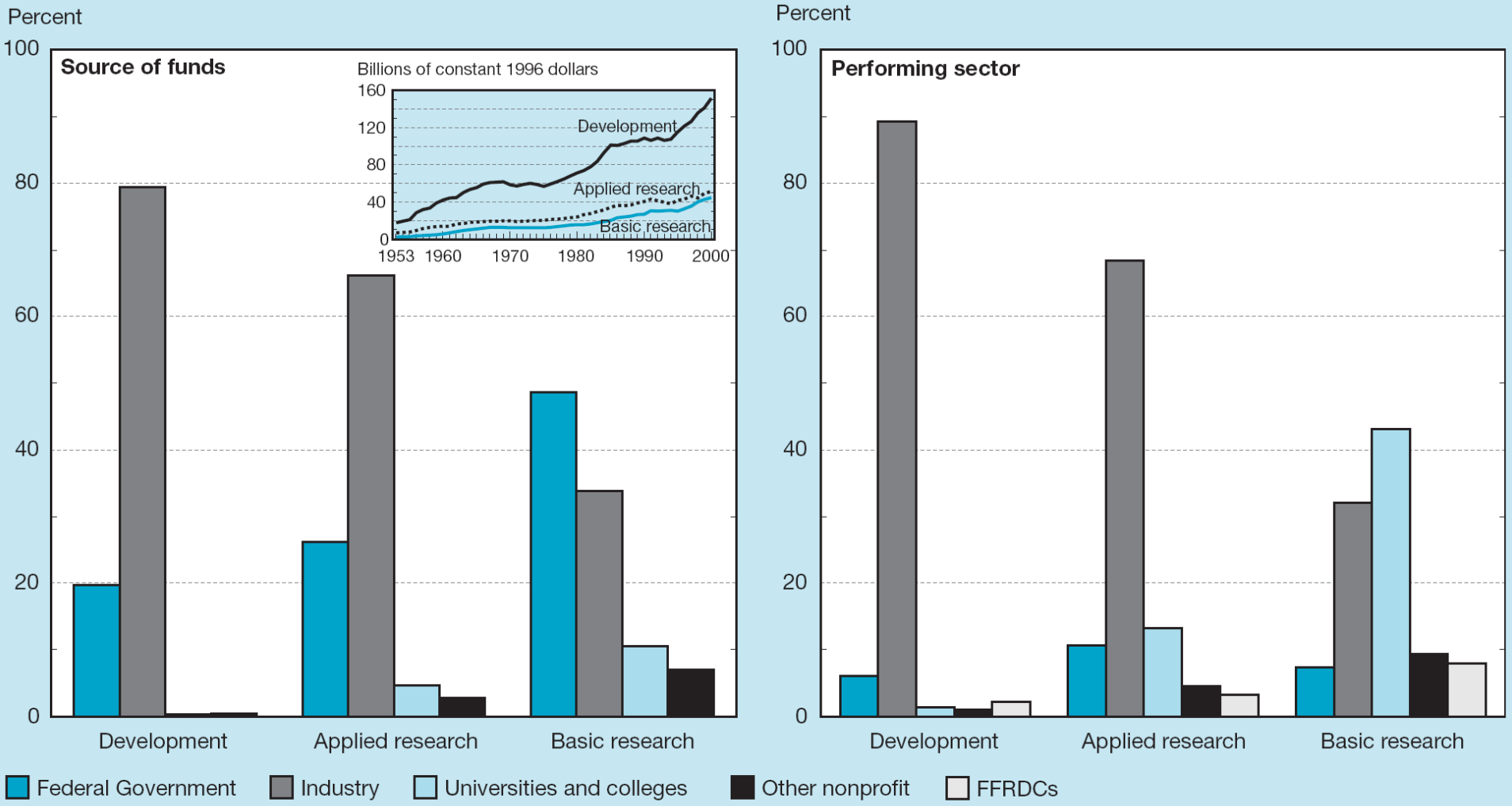
Eddie Bauer
"Nano-Care" Chinos

Source of U.S. research funding



NSF Science & Engineering Indicators, 2002

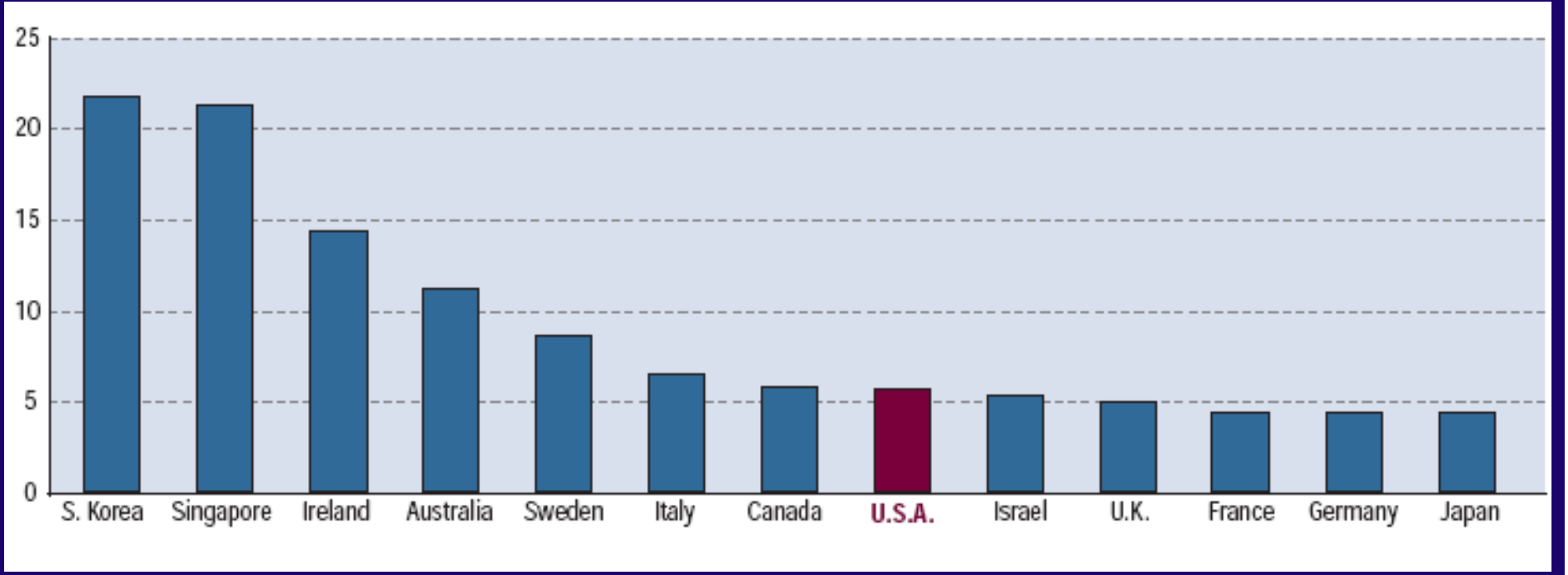
National R&D: Source, performer, type
(FY 2000)



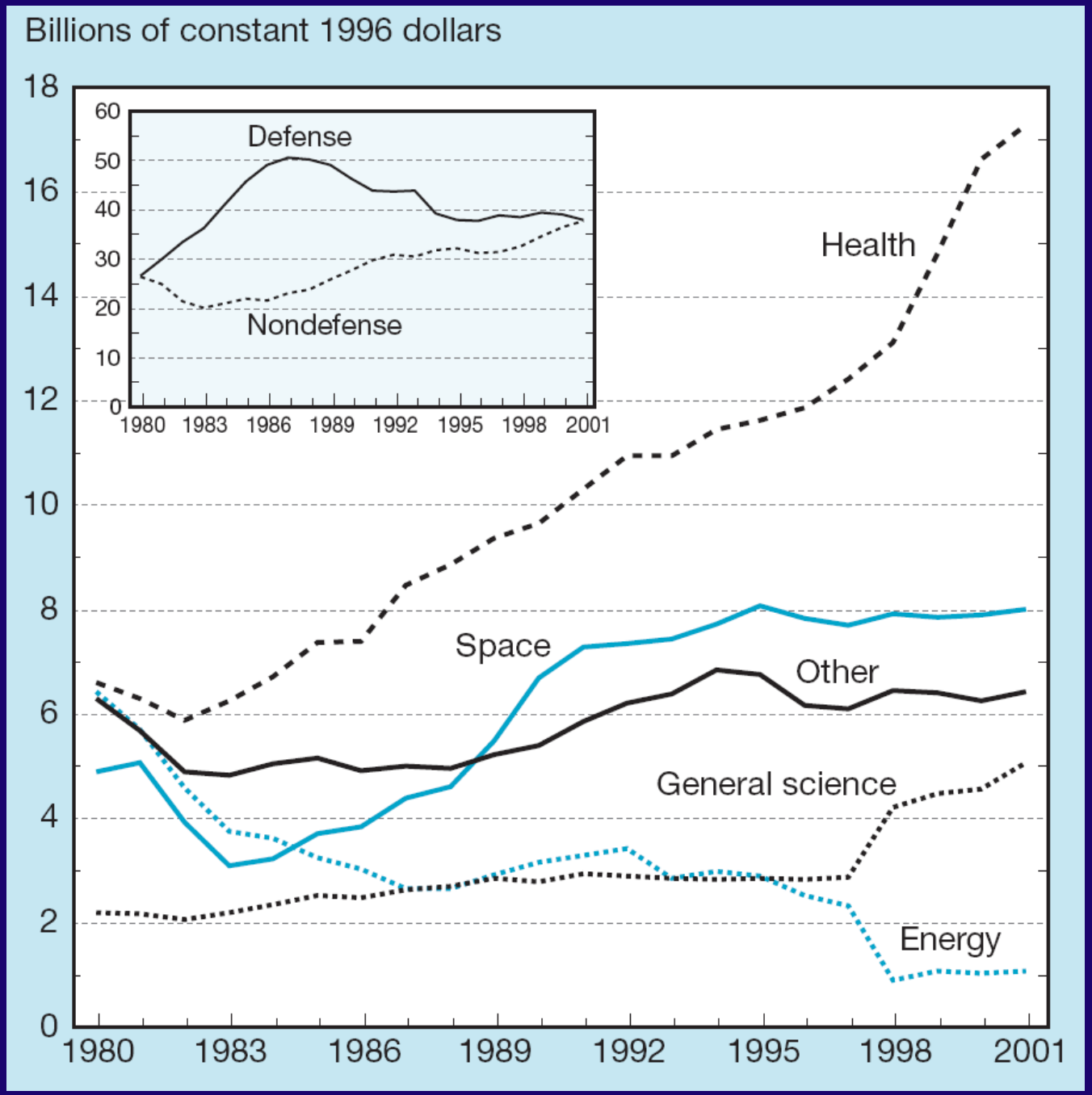
FFRDCs = Federally Funded Research and Development Centers

Compound annual R&D growth rate in R&D expenditures

(1985-1998)



U.S. Competitiveness 2001
Council on Competitiveness

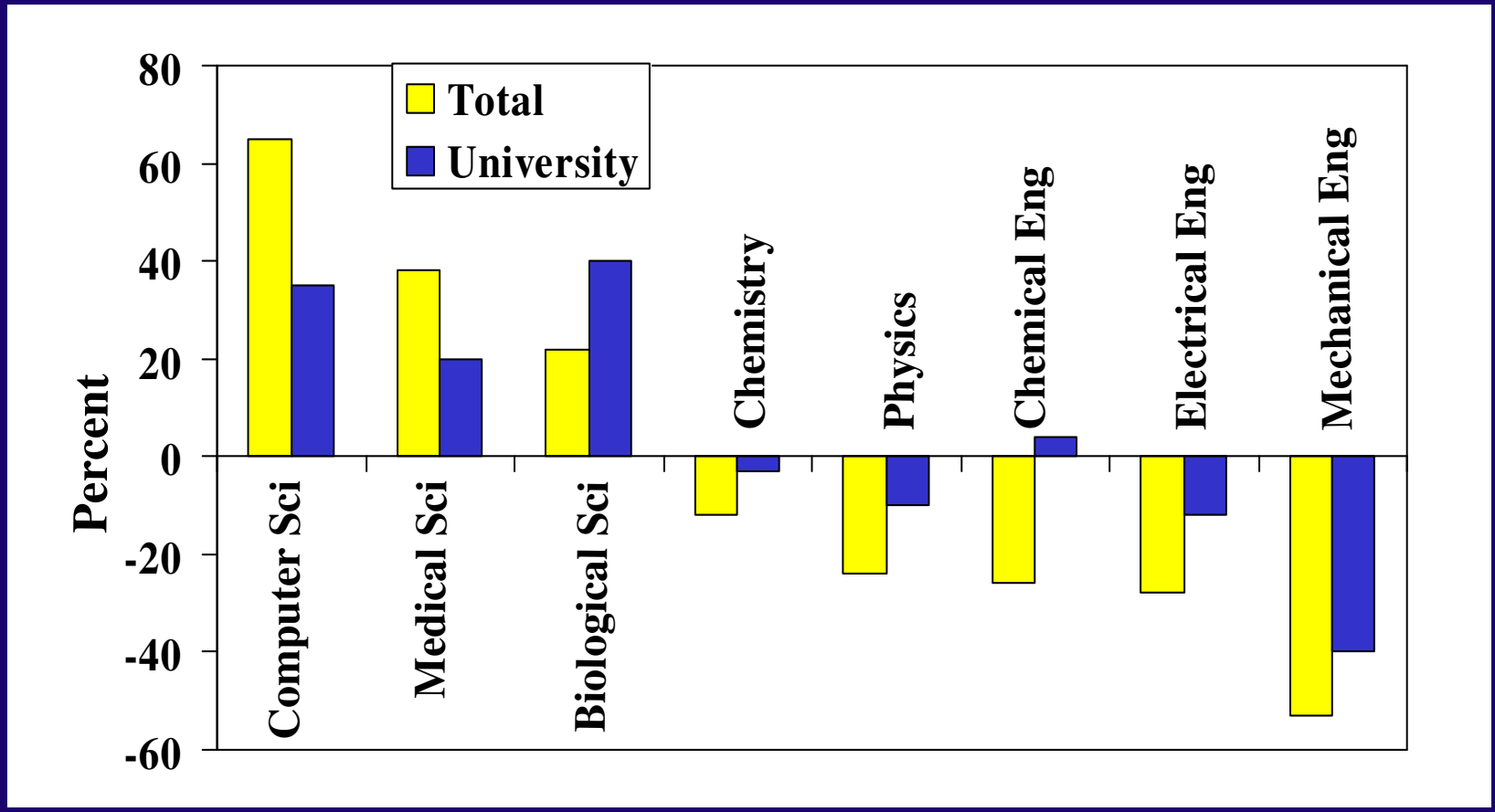


Federal R&D investment by budget function

NSF Science & Engineering Indicators 2002

Change in federal research funding

(FY 1993-1999)



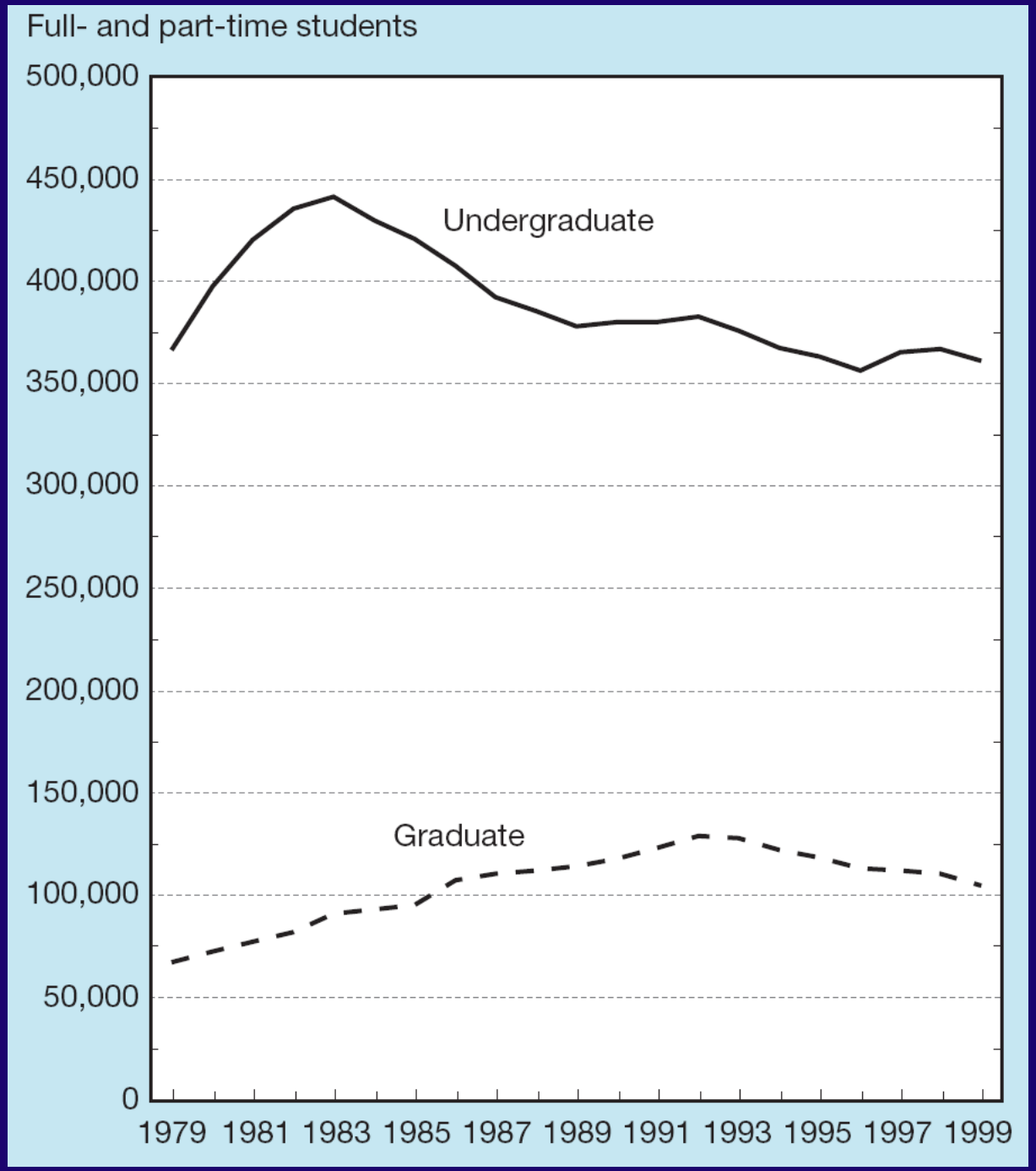
Trends in Federal Support of Research and Graduate Education
National Research Council




"It has proved impossible to predict reliably which areas of science will ultimately contribute to important new technologies."

Science, Technology and the Federal Government: National Goals for a New Era
COSEPUP

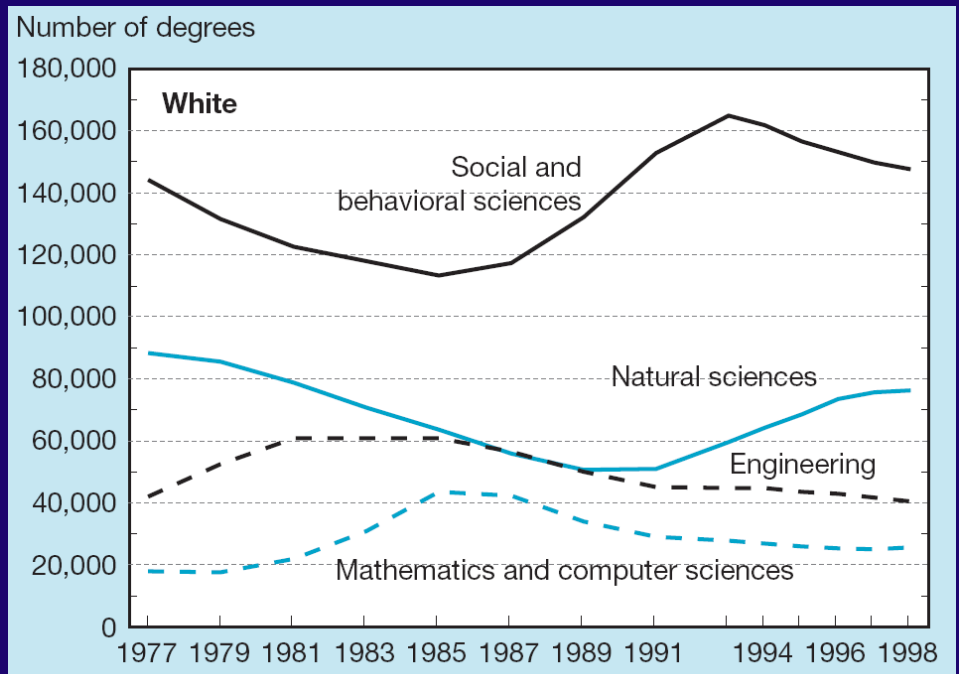
U.S. engineering enrollment

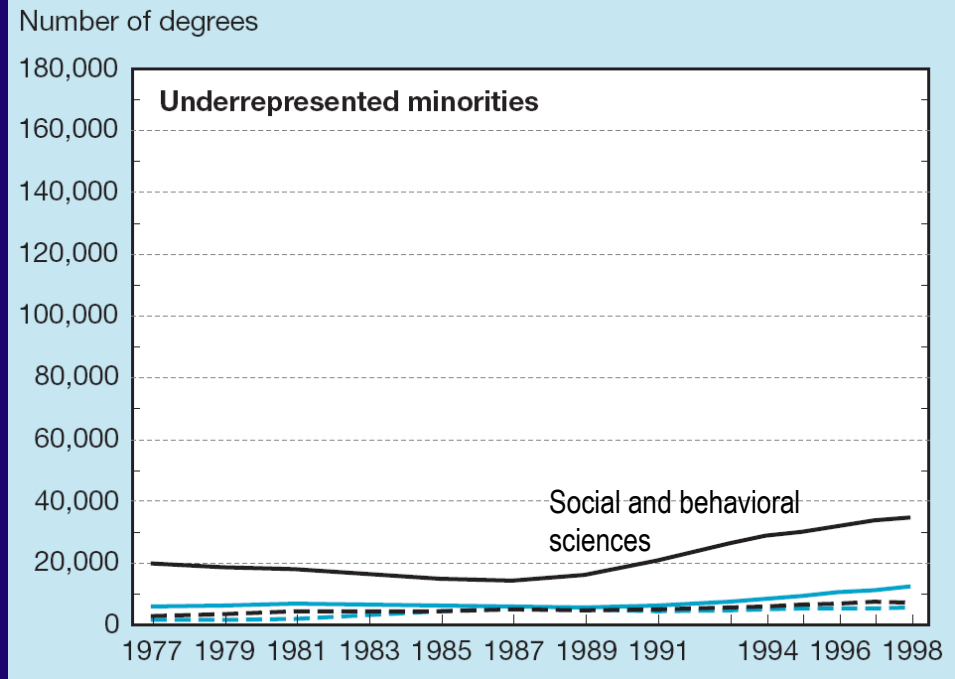


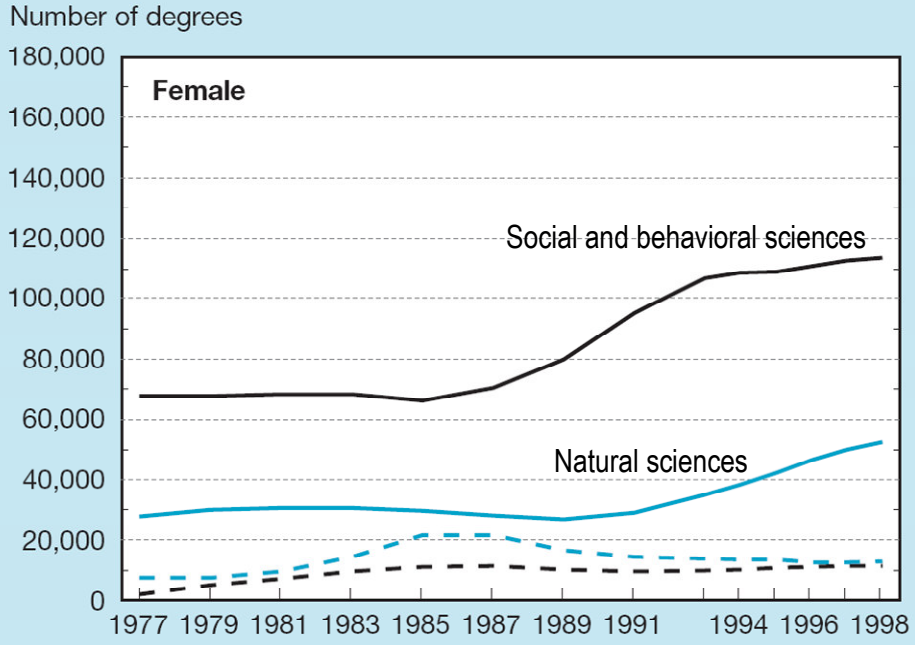
NSF Science & Engineering Indicators 2002

Bachelor's degrees awarded at U.S. universities

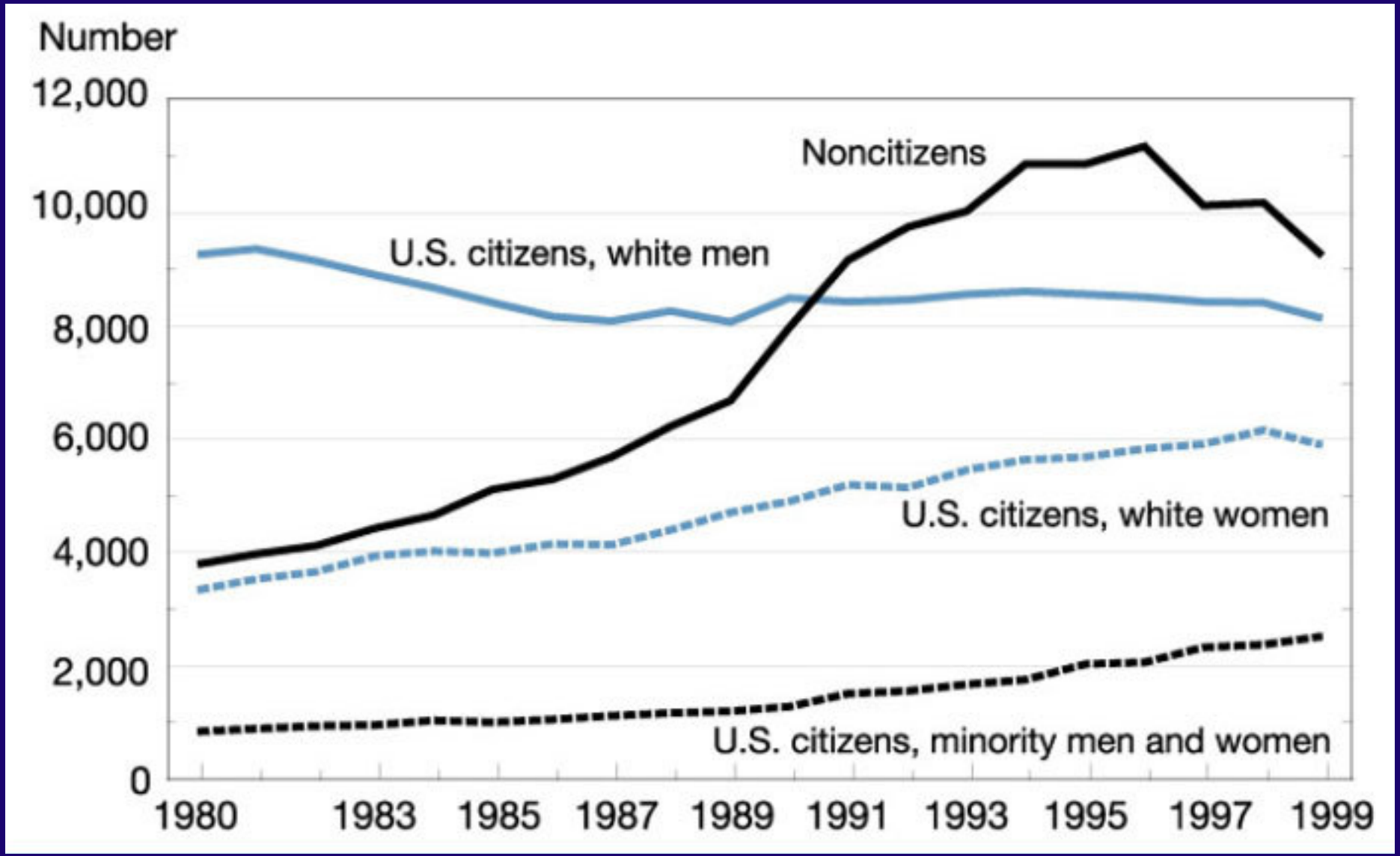
NSF Science & Engineering Indicators 2002



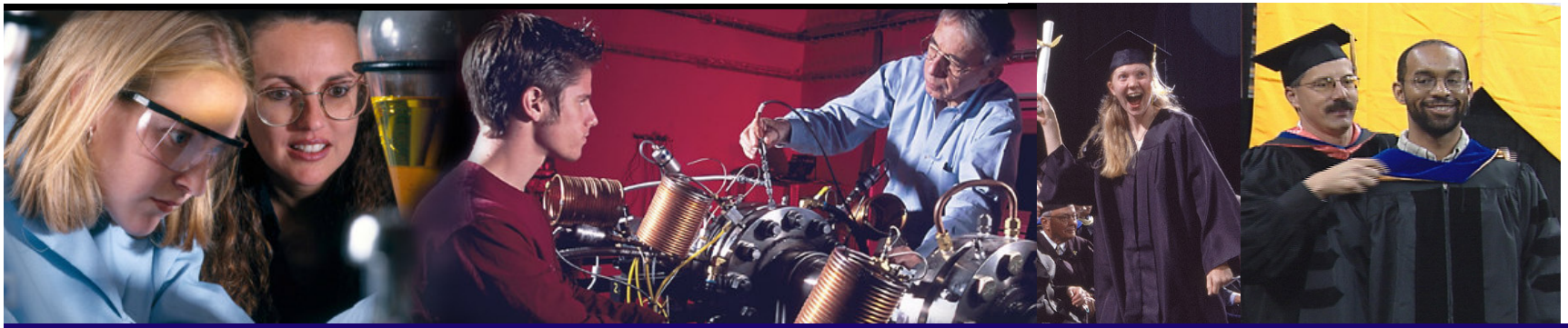




U.S. science & engineering doctorates



NSF Science & Engineering Indicators 2002



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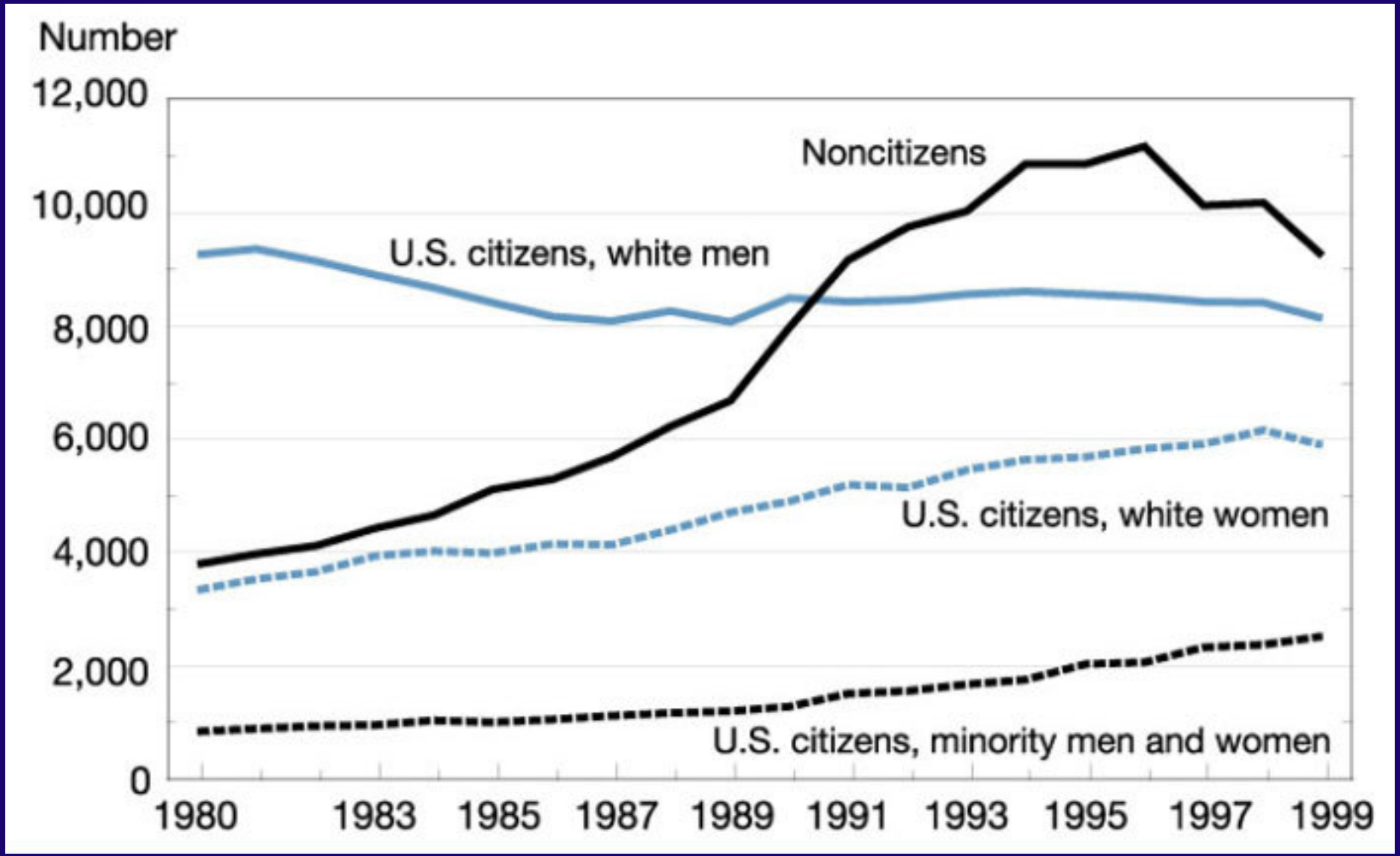
"With a drop in support for certain disciplines comes a drop-off in students and faculty entering those fields. We have seen this happening; the number of engineering, physical and environmental science degrees has been falling since the early 1990s."

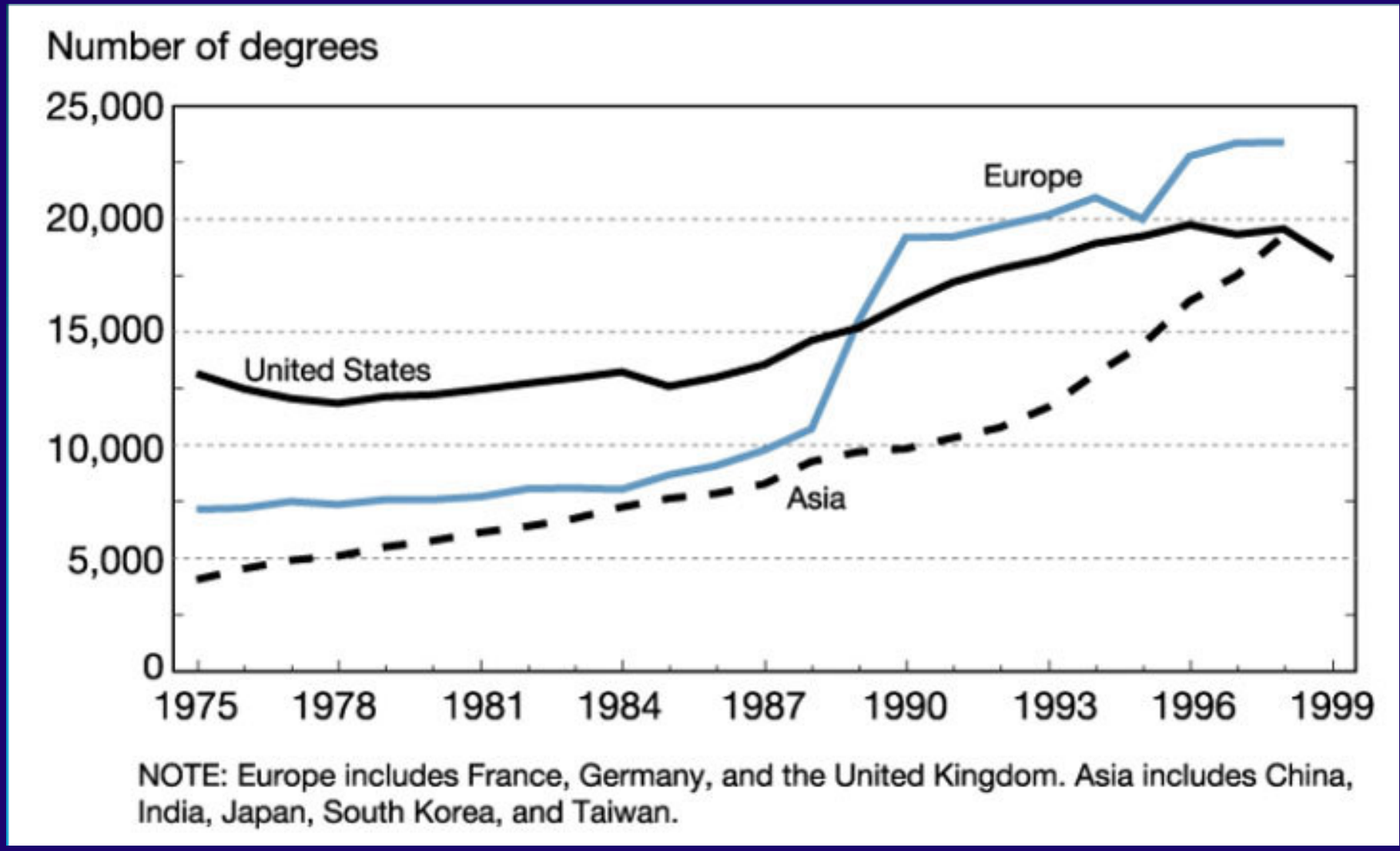
Assessing the U.S. R&D Investment
President's Council of Advisors on Science and Technology

U.S. science & engineering doctorates



NSF Science & Engineering Indicators 2002

Doctorates in natural sciences & engineering



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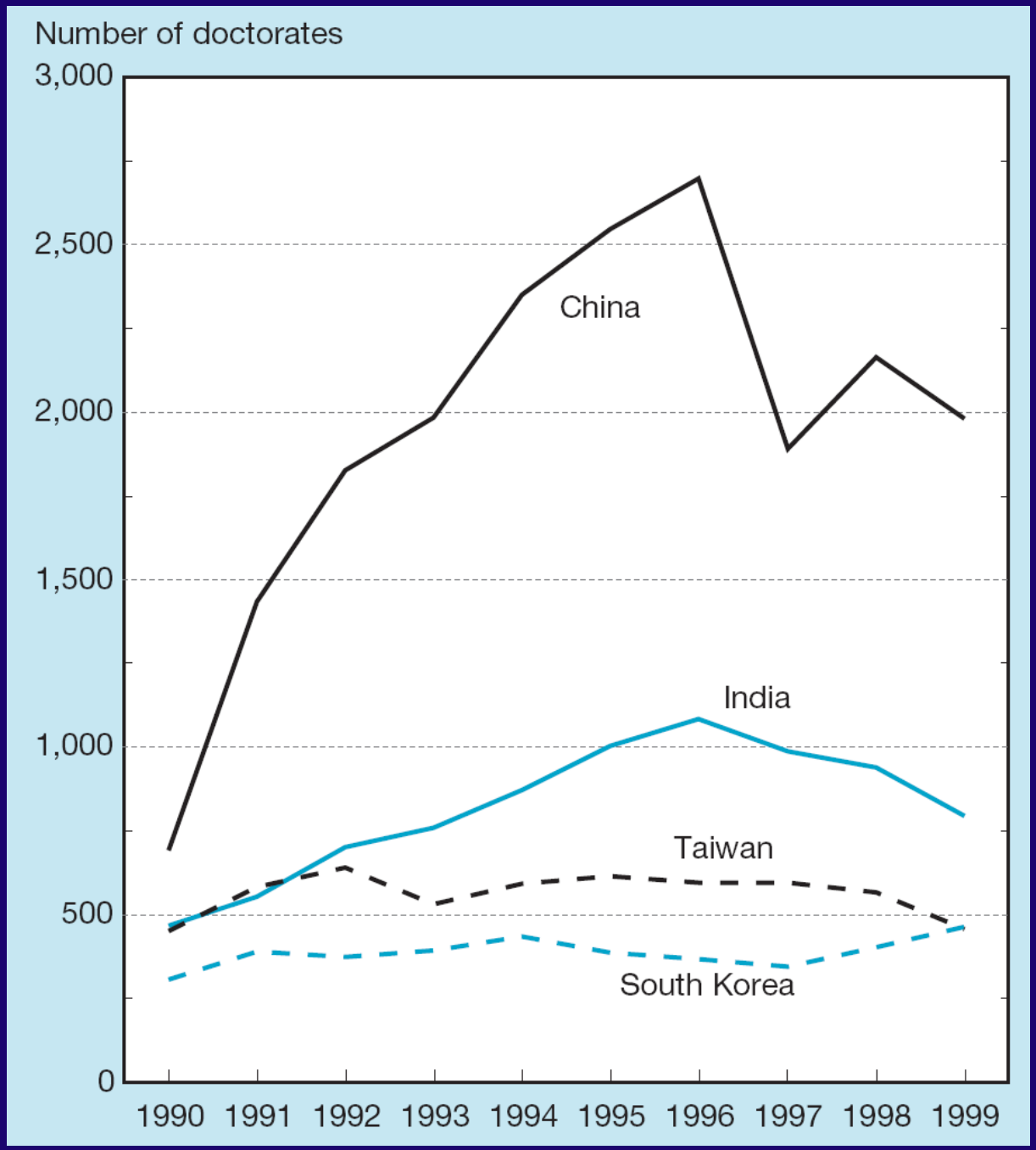

Doctoral students in science & engineering with plans to remain in the U.S.

NSF Science & Engineering Indicators 2002

By the end of 2004, one of every 10 jobs at U.S. computer-related companies will have moved to emerging markets where costs are lower.

Gartner Inc.

By 2015, 3.3 million white-collar jobs paying $136 billion in wages will have moved from the United States to lower cost countries, with the software and computer industry leading the exodus.

Forrester Research Inc.

In India, white-collar service and IT jobs from overseas are expected to employ 4 million people, generate $57 billion in revenues, and account for 7 % of the gross domestic product by 2008.

Joint study, McKinsey & Co and Indian software association Nasscom

"The biggest danger to U.S. workers isn't overseas competition. It's that we worry too much about other countries climbing up the ladder and not enough about finding the next higher rung for ourselves."

Michael Mandel
Chief Economist, *Business Week*
Aug 28, 2003 issue

At the crossroads: Concerns

- ⇨Imbalance in the federal research portfolio
  - →Fundamental research versus development and application
  - →Engineering and the physical sciences versus health and the life sciences
- ⇨Decline in interest in science and engineering on the part of U.S. students
- ⇨Flow of high-end technology jobs overseas

Beyond the crossroads

- ⇨Rebalance the federal portfolio, increasing research in engineering and the physical sciences.
- ⇨Encourage U.S. students to pursue science and engineering:
  - →Support for scholarships and fellowships
  - →Innovative curricula and degree programs
- ⇨Recognize that innovation is the key to maintaining a strong U.S. economy in the face of global competition.